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ABSTRACT

Capstones are culminating experiences in which students synthesize subject-matter knowledge they have acquired, integrate cross-disciplinary knowledge, and connect theory and application in preparation for entry into a career. Capstone courses should be both a synthesis and a bridge to students' future after graduation. In career and technical education (CTE), capstones are most often found in postsecondary business, agriculture, and allied health programs. However, their emphasis on integration, experiential learning, and real-world problem solving would make capstones valuable in any CTE field. Andreason and Wu's experiential model for capstones includes the following components: (1) receive (learners receive an activity or experience); (2) relate (learners relate learned experiences to previously gained knowledge); (3) reflect (learners reflect upon their experiences and relate them to each other); (4) refine (learners further contemplate the applicability of their new knowledge and its association with their previously gained knowledge); and (5) reconstruct (learners synthesize subject-matter content and integrate it into their knowledge base). The following are among the methods commonly used in capstone experiences: case analysis; multiple role play; living cases; storytelling; and computer simulations and games. Successful capstone experiences depend on the choice of activities/methods and on the characteristics and preparation of participating students. (Contains 15 references.) (MN)

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PRACTICE APPLICATION BRIEF NO. 16

Capstone Experiences in Career and Technical Education

by Sandra Kerka
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Capstones are culminating experiences in which students synthesize subject-matter knowledge they have acquired, integrate cross-disciplinary knowledge, and connect theory and application in preparation for entry into a career (Fairchild and Taylor 2000). Durel (1993) evocatively describes them as a "rite of passage" or "liminal threshold" through which participants change their status from student to graduate. A capstone course should be both a synthesis—reflection and integration—and a bridge—a real-world preparatory experience that focuses on the postgraduation future (Fairchild and Taylor 2000; Rhodus and Hoskins 1995). In career and technical education (CTE), capstones are most often found in postsecondary business, agriculture, and allied health programs; in their emphasis on integration, experiential learning, and real-world problem solving, they would be valuable in any CTE field. This *Brief* discusses the rationale for capstones, presents evidence of their effectiveness, and describes ways to use them in CTE.

Why Capstones?

Many types of work now require more than technical expertise (Fairchild and Taylor 2000; Magney 1996). In many fields, a wide range of nontechnical skills is now essential: leadership, teamwork, problem solving, decision making, critical thinking, interpersonal communication, information management (Fairchild and Taylor 2000; Rhodus and Hoskins 1995). For example, in organizations with flatter hierarchies, management responsibilities are now being downshifted to technicians (Magney 1996). Information technology graduates need not only specialized technical skills but also project management skills and awareness of global concerns and business practices (Novitzki 1998). Nurses must be prepared for change management, critical thinking, and interdisciplinary collaboration in the volatile health care field (Rains, Richardson, and Fowler 1999).

To achieve these outcomes, the objectives of a capstone course, project, or experience typically include the following (Fairchild and Taylor 2000; Rhodus and Hoskins 1995; Thomas 1998):

- To provide students an opportunity to synthesize knowledge from formal and informal learning and apply it to contemporary issues in the field
- To help prepare students for a successful career by providing experiences that enhance their labor market advantage
- To increase students' understanding of the big picture, including ethical and social issues related to the field
- To help students understand the relevance of theory and research to practice

How Effective Are Capstones?

What benefits do students receive from capstone experiences? Agriculture capstone graduates (Andreasen and Trede 1998) recognized the application of knowledge from other courses as the most beneficial outcome. Those who intended to teach felt the course prepared them for their first professional job. Fairchild and Taylor (2000) report that students who have completed capstone courses typically require less on-the-job training. In an evaluation of an agriculture and applied economics capstone that was selected as a national model ("Outcomes Assessment" 1998), 100% of completers said that it developed problem-solving, decision-making, critical thinking, and human relations skills.

In a nursing capstone, traditional students and registered nurses completing bachelor's degrees experienced different outcomes (Rains et al. 1999). Registered nurses viewed the course as an opportunity to rethink and refocus their careers; traditional students appreciated the holistic view of nursing it provided. The value of a culminating course was captured in one student's comment: "Final semester is when we are ready to hear" (p. 54). Sonner's (1999) research showed that performance in a capstone delivered via distance learning methods was higher for students who had previously taken at least one distance course. She speculates that capstone characteristics—integrative, creative, independent, self-motivating—may reflect the demands made of distance learners.

Hartenian, Schellenger, and Frederickson (2001) found that students in an integrated business course were extremely challenged by the demands of developing a semester-long case study of a manufacturing firm. They felt unprepared for teamwork and for shifting their perception of course activities from academic exercises to a real-world project involving an actual business. Their findings, as well as those of Sonner, Rains et al., and Novitzki (1998)—whose management information systems capstone worked well with nontraditional adult learners—suggest that a combination of student characteristics and preparatory experiences helps make capstones effective.

Using Capstones in Practice

"When learning activities and instructional techniques based upon the principles of experiential learning are applied in the capstone setting, the quality and benefits within these courses are improved" (Andreasen and Wu 1999, p. 76). Based on their findings, Andreasen and Wu developed an experiential learning model for capstones that has these components (pp. 75-76):

- **Receive:** An activity or experience is received by the learner. This activity or experience may be developed by the facilitator, may occur during the capstone course, or may have occurred during previous courses.
- **Relate:** Relating learned experiences to previously gained knowledge ties experiential learning to the capstone course philosophy.
- **Reflect:** Reflecting upon the experiences received and relating them to each other distinguish experiential learning from other types of learning.
- **Refine:** The refinement process causes further contemplation concerning the applicability of this knowledge and its association to and with other knowledge.
- **Reconstruct:** Learners synthesize the subject-matter content and integrate it into their knowledge base. They should then be able to apply what was learned to other situations.

Within such a framework, capstone objectives should be matched with appropriate methods and activities, taking into consideration such contextual factors as student background, instructor's teaching style, and available resources (Thomas 1998). Common methods include case analysis, multiple role play, living cases, storytelling, and simulations and games.

Case Analysis. The case method has a long tradition of use in business education. Well-developed and appropriate cases can engage critical thinking and communication skills, bridge theory and practice, and expose learners to true-life problems (Thomas 1998). However, traditional cases can be static and dated, are read passively,

and rely on text alone. In a business administration capstone designed around adult learning principles, Mundell and Pennarola (1999) applied a model that avoids these problems. Students are given an abundance of raw information sources; using groupware, teams reconstruct cases themselves from the data. They actively engage in interpretation and synthesis. The information sources are in interactive multimedia formats, including video. This model works best when students are, as in this example, adults with prior experience of teamwork, or when students are given training in group dynamics and the use of groupware.

Multiple Role Play. In this experiential method, students assume different roles in a hypothetical organization. In the semester-long case described by Hartenian et al. (2001), students were assigned roles in a fictional manufacturing company that were not the same as their major and were placed on cross-functional teams. In addressing case incidents, students had to consider the impact of their decision choices on their own function as well as others. They drew on their expertise (their majors) but also had to learn how to research and perform in other functions, in a realistic setting.

Living Cases. In a variation on case analysis, student teams work with local organizations to develop strategic plans or conduct projects. This approach develops research skills and fulfills the goals of integration and appreciation for the big picture. In a nursing capstone course, students attended seminars on leadership, assessment, and goal setting (Mellon and Nelson 1998). Then a self-directed student team created a health fair project for pregnant teens in collaboration with community agencies. They developed research skills through the collection of baseline data on their population. The project was actually implemented and evaluated as it would be on the job.

Storytelling. Storytelling is a part of organizational culture, communicating values, traits, and dynamics. Organizations use storytelling to make sense of their situation, induct new members, and bring about change (Thomas 1998). A capstone student teaching course in business education was conducted concurrently with the student teaching assignments (Keil and Olivo 1996). A primary function of the course was to provide student teachers a place to tell their practice stories, share ideas, discuss problems, and give and receive moral support. The capstone thus began the teacher induction process, fulfilling the bridging function of transition to professional careers.

Computer Simulations and Games. Widely used in business capstones, computer-based simulations "create an environment in which investigation can occur and students develop and use skills in hypothesis formulation, development, and testing" (Thomas 1998, p. 494). Fairchild and Taylor's (2000) agribusiness capstone uses *The Business Strategy Game: A Global Industry Simulation* by Thompson and Stappenbeck, in which students develop and implement a strategic business plan for a hypothetical firm and evaluate its financial impact on the organization's success. "The business strategy simulation makes business decisions and their consequences a reality, seriously challenges students in a team-based competitive framework, brings everything they have learned in the curriculum together in a meaningful manner, and creates new understanding from old material never before fully appreciated" (ibid., p. 13).

Successful capstone experiences depend upon the choice of activities and methods as well as characteristics and preparation of participating students. Some of the most effective teaching practices are requiring intensive writing and speaking, focusing on group work and team cooperation, using critical thinking to solve real-world problems, and involving real clients or representatives from business and the community (ibid.). Some hindering factors may include time constraints for both students and faculty; lack of retention of previous course material; lack of computer, team, writing, or communication skills; and difficulty developing or locating appropriate, high-quality projects, case materials, or activities (ibid.; Novitzki 1998).

In a capstone, which requires demonstration of mastery and self-direction, the instructor clearly takes the role of facilitator. However, "instructors sometimes have trouble becoming facilitators, and students very often have a great deal of trouble becoming self-motivated, self-directing learners" (Fairchild and Taylor 2000, p. 14). Capstones will best achieve their goals when the issues of student and instructor preparation for facilitation, teamwork, self-direction, and other requirements are addressed throughout the curriculum leading up to the culminating experience. Then students will be ready to bring together all their fragmented knowledge and skills into a coherent whole and to negotiate a successful passage from "the relative safety of the well-defined college learning environment" (ibid.) to the relative ambiguity associated with the world of work.

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